REMARKS/ARGUMENTS

Double Patenting

The applicant asserts that claims 1-3, 5-11, 13-44 and 83-109 of the instant application should not be rejected due to double patenting since the cited Nguyen reference (US pat. 7,146,521) fails to teach or suggest the claimed feature of "bringing the LMU on line while the JBOD emulation controller is on line, and taking the LMU off line while the JBOD emulation is on line."

In the Office Action dated March 31, 2009, the Examiner stated that the description in the cited Nguyen reference can be read as the above-mentioned claimed feature, which describes:

> *"removing the overheating disk drive from data storage operations if the controller detects the temperature of the overheating disk drive over a second threshold after the fan speed is increased, wherein the second threshold is greater than the first threshold; and temporarily activating the overheating drive so that data can be evacuated from the overheating disk drive to one or more properly functioning disk drives"*

Nevertheless, the applicant transverses such a rationale, and gives four points for expounding the difference between the aforementioned feature of the instant application and the teaching of the cited Nguyen reference. The four points are as follows:

(a) LMU is not a disk drive

The applicant points out that the claimed LMU is definitely not a disk drive. In fact, a **disk drive** is usually deemed as one type of **physical storage device (PSD)** for those skilled in the art. However, in claim 1, the applicant clearly specifies that "one logical media unit (LMU) comprising **sections of at least one of said group of PSDs**." In other words, the LMU is a virtualized concept, and probably comprises **more than one PSD**. Hence, the applicant believes that the claimed LMU cannot be considered as a single **disk drive**.

(b) "Removing the overheating disk drive" is not "taking the LMU off line"

First of all, according to point (a), the applicant believes that the operation of removing the overheating disk drive is not equal to the operation of taking the LMU off

line as the LMU is not a single disk drive. Also, according to Nguyen's teaching (column 7, lines 24-58), it can be found that removing the overheating disk drive is meant to remove **the disk drive that is overheating** from the storage component 18, but not to remove the disk drive that is not overheating, and not to make the RAID off-line. In this way, Nguyen also teaches **reconstructing** the data in the spun down or removed disk drives according to a redundant protocol such as **the RAID-1 or RAID-5** (column 7, line 32); on the other hand, if the RAID has been taken off line, then it is not likely to try to reconstruct the data in the removed one. Thus, it is unreasonable to remove **the whole RAID comprising the overheating disk drive** from the data storage system 10 while the overheating disk drive is removed since such redundant protocols need data in the other disk drives of the **RAID** (e.g. storage component 18) to reconstruct data in the removed one. That is, in the cited Nguyen reference, when one or some of the member disk drive(s) in the same RAID is(are) removed or spun down, the RAID is still on line, and the member disk drives that are properly functioning can still be accessed. However, on the contrary, in the instant application, once the LMU is taken off line, the data in the LMU can not be accessed any more until the LMU is brought on line again.

In addition, in the cited reference, when Nguyen's controller tries to regenerate data in the spun down disk drives but fails, Nguyen teaches **temporarily activating the overheating disk drive,** so that the data can be evacuated from the overheating disk drive into one or more properly functioning disk drive(s) (Nguyen's claim 1). Therefore, the applicant notes that the cited Nguyen reference **does not take the whole RAID off line but, instead, only removes one or more of the disk drive(s) which is(are) comprised in the RAID**. On the other hand, if Nguyen's teaching were similar to the claimed feature of taking the LMU off line, then no temporary activation operation and data accessing operation would be performed to evacuate the data in the spun down disk drives.

The applicant points out that the operation of taking the LMU off line is meant to take off line **the whole LMU virtualized by sections of the group of PSDs**. Hence, the claimed JBOD emulation controller can never perform data accessing operation on the off-lined LMU once the LMU is taken off line by the JBOD emulation controller.

(c) "Temporarily activating the overheating drive" is not "bringing the LMU on line"

Concerning the operation of temporarily activating the overheating drive, such an operation is meant to temporarily activate the overheating disk drive in order to evacuate the data in the overheating disk drive, and moves data from the overheating disk drive to properly functioning disk drives (see in column 7, lines 42-49 of Nguyen's disclosure). Accordingly, after the data has been evacuated from the overheating disk drive, the overheating disk drive will be de-activated and will not be activated any more. However, the operation of temporarily activating the overheating drive is not equivalent to the operation of bringing LMU on line because (1) the spun down disk drives rather than RAID or LMU are temporarily activated; and (2) no RAID or LMU had been taken off line before temporarily activating the overheating disk drive, and thus, there is no need to bring the RAID or the LMU on line.

On the contrary, the claimed feature of bringing the LMU on line is meant to keep the whole LMU on line, and once the LMU is taken on line, all sections of the group of PSDs comprised in the LMU **can be accessed consistently rather than** temporarily **activated or accessed**.

(d) <u>The objectives of the instant application and the cited Nguyen are different</u>

The objective of the cited Nguyen is "re-constructing the data in the overheating disk drive(s) into other properly functioning disk drives" rather than "taking the LMU off-line when the SVC is on-line and bring the LMU on when the SVC is on- line." Please refer to the abstract and the column 7, lines 30 to line 49 and claim 1 of cited Nguyen, for such a purpose, there is no need to take the RAID including spun down drives off-line where no data in the RAID can be accessed, and then bring the RAID including spun down drives on-line where the data in the RAID can then be accessed. On the contrary, to achieve such a purpose, it has to keep the RAID always on-line, which includes spun down drives, so that it can try to re-construct the data in the spun down drives from other drives, or to temporarily the spun down drives to evacuate the data. If a RAID is off-line, no drive can be accessed and this it is not likely to perform the re-construction of the data, or the temporarily activating and evacuating of the data. Contrarily, **the instant application can selectively take the whole LMU off line or bring the whole LMU on line** under the control of the JBOD emulation controller.

In view of aforementioned points (a) to (d), the applicants asserts that at least the claimed feature of the bringing the LMU on line while the JBOD emulation controller is on line, and taking the LMU off line while the JBOD emulation is on line has never been taught or suggested by the cited Nguyen reference. Thus, claims 1-3, 5-11, 13-44 and 83-109 should be found patentable over claims 1-4, 6, 7, 10-22, 24-27, 29, 30, 32-53, 78-87, 90-93 and 97-103 of copending application No. 10/707,871 in view of the cited Nguyen reference. Withdrawal of the double patenting rejection is respectfully requested.

Claims 1-3, 5-9, 11, 13-17, 24-29, 31-35, 38-40, 44, 83, 84, 86-96, 98-100, 102, 103, 105-107 and 109 are rejected under 35 USC 103a as being unpatentable over Bicknell et al. (US Pub. 2003/0193776) in view of Meehan et al. (US pub. 2004/0177218) and further in view of Nguyen et al. (US pat. 7,146,521).

Independent claims 1, 8, 83, and 92

Concerning the patentability of claim 1, the applicant asserts that the claimed feature, "bringing the LMU on line while the JBOD emulation controller is on line, and taking the LMU off line while the JBOD emulation controller is on line" has never been taught or suggested by the cited Nguyen reference based upon the same argument made to the double patenting rejection of claim 1. Thus, the applicant asserts that claim 1 of the present invention should be found allowable in view of the cited references because the combination of the cited reference fails to teach all of the features recited in claim 1. Similar arguments also apply to independent claims 8, 83, and 92; and the various dependent claims should also be found allowable for at least the same reasons as their respective base claims. Consideration of claims 1-3, 5-9, 11, 13-17, 24-29, 31-35, 38-40, 44, 83, 84, 86-96, 98-100, 102, 103, 105-107 and 109 in view of these arguments is respectfully requested.

Further comments regarding the patentability of particular dependent claims with respect to the cited references are provided as below.

Dependent claims 13, 86 and 89

The instant application claims comprising **auto-on-lining mechanism** to automatically bring on line a said LMU which was previously off-line once **a requisite quorum of said PSDs** comes on-line.

However, as described above, Nguyen never teaches taking a whole RAID (e.g. LMU) off-line, so it is impossible that Nguyen discloses an auto-on-lining mechanism to automatically bring on line a said LMU which was previously off-line. Also, note is respectfully made by the applicant that Nguyen merely teaches **temporarily activating an overheating disk drive rather than bringing a whole RAID on line.**

Dependent claims 14, 87 and 90

Similar to the argument made to claim 1, Nguyen only teaches removing an overheating disk drive rather than taking off line a whole RAID. Thus, the claimed feature of **auto-off-lining mechanism** to automatically take off line a said LMU is by no means taught or suggested by Nguyen.

Dependent claim 16

The instant application claims "comprising scanning-in mechanism to automatically scan in PSDs on detection of insertion of the PSD." Please refer to [0077] of the present invention in which [0077] in order to support the above-mentioned features of the present invention JBOD subsystem, the JBOD subsystem can further comprises an auto-on-lining mechanism to automatically bring on line a said logical media unit which was previously off-line once a requisite quorum of said PSDs comes on-line, an auto-off-lining mechanism to automatically take off line a said logical media unit which was previously on-line once a requisite quorum of said PSDs becomes off-line, a determining mechanism for automatically determining when a PSD has been removed or when one has been inserted, and a scanning-in mechanism to automatically scan in PSDs on detection of insertion of the PSD. That is, the scanning-in mechanism of the present invention automatically scan in PSDs upon detection of insertion of the PSD.

In contrast, paragraph 0003 of Bicknell only discloses "an electrical connection with the midplane card for data communication with the disc drives", but fails to teach or suggest "such a scanning-in mechanism" at all, not to speak of "automatically scanning in PSDs on detection of insertion of the PSD" of the present invention.

Dependent claim 17

The instant application claims "comprising information mechanism for informing the host entity when the mapping of said LMUs to host-side interconnect LUNs has changed." Please refer to paragraph 0079 of the present invention, in which [0079] In general, when the mapping of LMUs to the host-side IO device interconnect LUNs has changed, either when an LMU is newly introduced onto the Fibre loop or when an existing LMU is removed therefrom, the host entity will be informed of such change. An example of such JBOD emulation controller is that when the host-side IO device interconnect is a Fibre operating in Arbitrated Loop mode, while the external JBOD emulation controller can issue a LIP when a new target ID is introduced onto the Fibre loop or is removed from the Fibre loop so as to inform other devices on the loop that the loop device map has changed. Another example is that when the JBOD emulation controller support standard SCSI command set as a primary command interface with the host entity over the host-side IO device interconnect, the JBOD emulation controller posts a status of "CHECK CONDITION" to the host entity with sense key of "UNIT ATTENTION" and sense code of "REPORTED LUNS DATA HAS CHANGED" to inform the host entity when the mapping of LMUs to the host-side IO device interconnect LUNs has changed. That is, for example, when an LMU is newly introduced onto the Fibre loop or when an existing LMU is removed therefrom, i.e., the mapping of LMUs to the host-side IO device interconnect LUNs has changed, the host entity will be informed of such a change of mapping of LMUs to the host-side interconnect LUNs. In other words, change of mapping depends on insertion/removal of the LMU. Upon insertion/removal of the LMU, change of mapping to the host-side IO device interconnect LUNs happens.

In contrast, paragraph 0017 of Bicknell only discloses "Each intermediate

electronic component 110 determines which controller 108 is provided data access to a particular disc drive 106 by opening and closing data communication paths between the disc drive 106 and each of the controller 108. In the event that one of the controller 108 fails, data stored in the disc drives 106 can still be accessed by the host computer through the remaining active controller 108. In this manner, the reliability of disc storage subsystem 100 is improved", but fails to teach or suggest "informing the host entity when the mapping of said LMUs to host-side interconnect LUNs has changed" of the present invention."

Dependent claim 32

Claim 32 of the instant application claim "comprising an enclosure management services mechanism." Please refer to [0093] of the instant application in which "Yet another feature of a JBOD subsystem is enclosure management services (EMS). This is an intelligent circuitry **that monitors status of various enclosure devices, such as power supplies, fans, temperatures, etc. and can be interrogated by a host for these statuses.**" That is, the instant application claims comprising an enclosure management services (EMS) mechanism, in which the EMS mechanism is an intelligent circuitry that monitors status of various enclosure devices, such as power supplies, fans, temperatures, etc. and can be interrogated by a host for these statuses.

In contrast, paragraph 0037 of Bicknell only discloses "the multiplexing electronics selectively opens and closes the first and second data communication paths in response to at least one control signal (such as 218 or 220)". Mux can not perform the functions the EMS mechanism like **monitoring status of various enclosure devices, such as power supplies, fans, temperatures, etc. power supplies, fans, temperatures, etc.** In other words, **obviously, MUX 208 of Bicknell is not equal to the EMS of the present invention, and naturally** fails to disclose, such as the **EMS mechanism which is an intelligent circuitry that monitors status of various enclosure devices, such as power supplies, fans, temperatures, etc. power supplies, fans, temperatures, etc.**

Dependent claims 95, 99, 102 and 106

Claims 95, 99, 102 and 106 of the instant application claim "wherein said external JBOD emulation controller is adapted for accommodating said group of PSDs of different serial protocols." In other words, said SVCs are adapted for accommodating said group of PSDs of different serial protocols i.e., SAS PSD and SATA PSDs.

In contrast, column 7, lines 55-58 of Nguyen only disclose "in one embodiment, data storage operations are in accordance with the RAID-1 or RAID-5 protocol, and therefore load balancing takes the parameters of these protocols into account", **but does not teach or suggest any thing regarding PSDs of different serial protocols i.e., SAS PSD and SATA PSDs of the present invention.** Therefore, applicant asserts that Nguyen fails to teach or suggest "said SVCs are adapted for accommodating said group of PSDs of different serial protocols."

Since all independent claims of the instant application are in condition for allowance, all dependent claims which depend on the independent claims should be allowable, too.

Claims 18-23 and 30, are rejected under 35 USC 103a as being unpatentable over Bicknell et al. (US Pub. 2003/0193776) in ivew of Meehan et al. (US pub. 2004/0177218) and Nguyen et al. (US pat. 7,146,521) as applied to claim 8, and further in view of Watanable (US pub. 2004/0260873).

Dependent claim 18

The instant application claims comprising unique ID determination mechanism to uniquely identify said PSDs independent of their location in which they are installed in the JBOD subsystem. Please refer to [0086] of the instant application, in which "In other embodiment of the present invention, the JBOD subsystem can also comprise an

unique ID determination mechanism to uniquely identify said PSDs independent of their location in which they are installed in the JBOD subsystem, wherein information used to uniquely identify each of said PSDs can be stored on the PSD. LMU identification and configuration information can be stored on the member PSDs that compose the LMU." That is, the unique ID determination mechanism is used to uniquely identify said PSDs independent of their location in which they are installed in the JBOD subsystem. Once previously removed PSD that is previously provided with the unique ID, is re-inserted into the JBOD subsystem, the unique ID determination mechanism can uniquely identify said PSDs through the unique ID independent of their location, i.e., does not relate to the location into which the previously removed PSD is inserted.

In contrast, paragraph 0114 of Watanable only discloses "each volume 1101a-c is assigned to the physical port 1103a-c which is addressable on a storage I/O interface (e.g., IO I/F 331 of FIG.3) when a volume is accessed from a host (e.g., host 301).", but fail to teach "to uniquely identify said PSDs independent of their location in which they are installed in the JBOD subsystem."

Dependent claim 23

The instant application claims "LMU identification information presented to the host entity is generated as follows: from information stored in a non-volatile memory in the JBOD subsystem prior to being able to obtain LMU identification information off of the member PSDs and from LMU identification information stored on the member PSDs that compose the LMU after the member PSDs become accessible".

Please refer to paragraph [0083] of the instant application, in which "If a PSD whose identification information has already been stored to non-volatile memory as above has failed or is removed from the JBOD emulation SV subsystem while the subsystem is in a powered-down state and then the subsystem is subsequently powered up, during power-up initialization process and prior to being able to determine that the PSD is not present and/or its identification information not accessible, the SVC may present the original PSD's identification information to the

host. Only after the SVC finally determines that the PSD is not present or no longer accessible will it discover that it has presented the wrong information to the host. At this point, the JBOD emulation SV subsystem would typically emulate a PSD removal in an attempt to alert the host that it should re-scan the PSD", and to paragraph [0084] of the instant application, in which "If a new PSD is inserted into a powered-down SV subsystem and the subsystem is subsequently powered up, the new PSDs identification information will still remain unavailable until the SVC is able to successfully read the information from the reserved space on the PSD, so a relatively extended latency will be incurred. If the PSD has never been configured before such that it does not have any identification or configuration information stored on it, the JBOD emulation SV subsystem may elect to ignore it, requiring that each usable PSD must be pre-configured (e.g., factory configured), or it may generate a set of identification and configuration information for the PSD and store it to reserved space on the PSD, at the same time, making a copy to non-volatile memory. If the newly inserted PSD does have identification and configuration information already written on it, then the appropriate information would be copied to non-volatile memory. If there was no previous identification information associated with the particular host-side interconnect ID/LUN, then the JBOD emulation SV subsystem would simply alert the host(s) to rescan the interconnect for new PSDs. If, on the other hand, the host-side interconnect ID/LUN to be associated with the new PSD is identical to the ID/LUN associated with a PSD that has been removed or otherwise is no longer active, the SVC may already have a record of the original PSD and associated identification information in non-volatile memory. During power-up initialization, prior to being able to successfully read the identification information off of the new PSD, the SVC may end up presenting the original PSD's identification information to the host. Only after the SVC finally reads the information off of the new PSD will it discover that it has presented the wrong information. At this point, the JBOD emulation SV subsystem would typically emulate a PSD removal followed by an insertion in an attempt to alert the host that it should re-scan the PSD." From the above descriptions, it can be concluded (1) that prior to being able to obtain LMU

identification information off of the member PSDs, LMU identification information presented to the host entity is generated from information stored in the non-volatile memory in the JBOD subsystem, and (2) that after the member PSDs become accessible, LMU identification information presented to the host entity is generated from LMU identification information stored on the member PSDs that compose the LMU. That is, how to obtain LMU identification information depends on whether the member PSDs become accessible or not, which is the key point of obtaining the LMU identification information.

In contrast, paragraphs 0065, 0094, and 0114 of Watanable only disclose assignment of ID to the host, "input, intermediate or resulting data or functional elements can further reside more transitionally or more persistently in a storage media, cache or other volatile or non-volatile memory, (e.g. storage device 307 or memory 308) in accordance with a particular application", and "each volume 1101a-c is assigned to the physical port 1103a-c which is addressable on a storage I/O interface (e.g., IO I/F 331 of FIG. 3) when a volume is accessed from a host (e.g., host 301). Each volume is also assigned a unique ID 1104a-c, for example a WWN reference for fiber channel, a SCSI name for iSCSI, and so on.", but **fail at all to teach or suggest where to obtain the LMU identification information before being able to obtain LMU identification information off of the member PSDs, and where to obtain the LMU identification information after the member PSDs become accessible.**

Conclusion

Thus, all pending claims are submitted to be in condition for allowance with respect to the cited art for at least the reasons presented above. The Examiner is encouraged to telephone the undersigned if there are informalities that can be resolved in a phone conversation, or if the Examiner has any ideas or suggestions for further advancing the prosecution of this case.

Sincerely yours,

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